***Arctostaphylos Nevadensis* - Plant Propagation Protocol**
ESRM 412 – Native Plant Production

TAXONOMY

Family Names

Family Scientific Name:	*Ericaceae*
Family Common Name:	Heath Family

Scientific Names

Genus:	*Arctostaphylos*
Species:	*nevadensis*
Species Authority:	Gray
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	

Common Synonym:

Genus:	*Arctostaphylos*
Species:	*Pungens*
Species Authority:	Kunth
Variety:	
Sub-species:	ssp. *nevadensis*
Cultivar:	
Authority for Variety/Sub-species:	(Gray) J.B. Roof
Common Name:	Pinemat Manzanita, kinnikkinnick.
Species Code:	ARNE

GENERAL INFORMATION

General Distribution:	Found in Washington, Oregon, California and Nevada.. *nevadensis* is found on acidic and well drained soils, particularly in rocky outcroppings.[i]
Climate and elevation range	Between 5,000 and 10,000 feet in elevation on sites with warm summers and cold winters with most precipitation from snow.[ii]
Local habitat and abundance;	Typically found on the montane east side, especially in open stands of lodgepole pine and yellow pine.[iii]
Plant strategy type	Fire adapted, growing on otherwise marginal sites, with semi-prostrate form that roots easily on disturbed soils or when buried, indicating an early colonizer.

PROPAGATION DETAILS

Ecotype:	
Propagation Goal:	Plants
Propagation Method:	Seed (Note that a protocol for propagation from cuttings exists and some authors suggest it may be easier to propagate *A. nevadensis* from cuttings.) See "Other Comments" below.
Product Type:	Container

Stock Type:	1-Gallon Containers
Time to Grow:	12-14 Months or overwintered an additional year.
Target Specifications:	Branched base and well developed root structure.
Propagule Collection:	Berries should be collected when ripe, between July and September depending on site.[iv] Fruit can be hand collected directly from plants or fallen fruit from the ground.[v] Some reports suggest collecting the duff from beneath established plants, screening coarse debris and applying to seed beds to take advantage of seeds that have "naturally stratified."[vi] In a comparative study Carlson and Sharp note that improved germination rates in Greenleaf Manzanita (*A. patula*) were linked with seed sourced from irrigated shrubs, suggesting a possible route to improving the notoriously poor germination rate of *A. nevadensis*.[vii] Care should be taken in collecting seeds due to the propensity of *A. nevadensis* to hybridize with *A. uva-ursi* and *A. Columbiana* and possibly *A. glandulosa*.[viii] Where growing together with these species or their hybrids, collectors should consider collecting cuttings for vegetative propagation (see "Other Comments") or collecting from another site.
Propagule Processing/Propagule Characteristics:	Other *Arctostaphylos* spp. yield 40-60 seeds/gram.[ix] Seeds carried in small berries and should be removed by macerating and separating with flotation or blowing.[x] Seed storage should be dry, dark and cold (5-15°C) [xi]
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Two alternative treatments are described for breaking seed dormancy of *Arctostaphylos* spp. The first is the use of acid scarification for 3-4 hours to remove a tissue plug that blocks the root and hypocotyl.[xii] Subsequent work by Trindle suggests that the micropyle plug is dissolved following a 25 minute acid scarification, and that longer treatments demonstrating weakening of the seed coat are likely to result in damage to the embryo.[xiii] Carlson and Sharp observe that previous studies report a "maximum 5 percent germination" following acid scarification and extended cold stratification.[xiv] The alternative treatment recommended by several authors is the use of burning to break dormancy. In this case the seeds are buried in ¼ to ½ inch clean sand burning a combustible over the surface. Bean recommends the use of straw or pine-needles, followed by a stratification at 36-40°F.[xv] Sheat, in contrast,

	recommends burning "wood wool" over the seedbed for one hour followed by thorough damping.[xvi] While Macdonald notes that this method is not always reliable,[xvii] Oosting and Billings have observed *A. nevadensis* to establish in large numbers from the soil seed bank following fire.[xviii]
Growing Area Preparation / Annual Practices for Perennial Crops:	Sow in a medium of peat and sand mixed at a 1:1 ratio.[xix] Some authors suggest sowing in late Summer and mulching to protect until Spring germination.[xx] Given this recommendation, sowing into prepared seed beds with the expectation of later pricking out to individual gallon pots will save nursery space.
Establishment Phase:	Mulch and protect from freezing.
Length of Establishment Phase:	7-8 months.
Active Growth Phase:	After transfer to gallon containers, shift to shadehouse. Water when necessary, considering preference for well drained sites, (perhaps 1-2 times weekly) and treat with half strength 20-20-20 fertilizer every other week.[xxi] Sparse leaf coverage from this relatively slow growing and open form plant can result in mosses and liverworts building up on the soil surface.[xxii] While chemical treatments are available, the infrequent watering schedule recommended here should result in a dry soil surface that will avoid this growth.
Length of Active Growth Phase:	3 Months, May through July.
Hardening Phase:	Decrease watering interval and cease fertilizer treatment. Remove shadecloth to aid in hardening.[xxiii]
Length of Hardening Phase:	3 months, August to October.
Harvesting, Storage and Shipping:	Plants not shipped after the growing season can be held at 38-40°F unlit and monitored for soil moisture over the winter. Returned to a polyhouse in spring to begin growth again.[xxiv]
Length of Storage:	3-4 Months.
Guidelines for Outplanting / Performance on Typical Sites	Given the preference of the species for sites that are warm and dry in the summer, fall planting prior to winter snows is recommended.[xxv] Given the planting sequence recommended above, this suggests planting during hardening or storing the plants over winter and planting during hardening the following year. Experimental results with site fertilization found that *A. nevadensis* failed to increase in the concentration of foliar N after application, suggesting that at many suitable sites it is approaching optimal conditions and fertilization with macronutrients may result in competitor plants displacing it.[xxvi]
Other Comments:	As noted several times in the text above, layering or

starting from cuttings has proven to be more successful in many cases than cultivation from seeds.[xxvii] See http://www.nativeplantnetwork.org/network/view.asp?protocol_id=2350

INFORMATION SOURCES

References: See below

Other Sources Not Consulted: Linnenbrink, N. "In vitro cultures of *Arctostaphylos* species. I. Development of an in vitro culture method for *Arctostaphylos uva-ursi* and *A. nevadensis*." In Archiv fur Pharmazie, v. 316, 1983 #2 pp97-100. (in German)

Name of Author: Brendan Impson

Date Entered or Updated: 07/01/07

---

[i] USDA NRCS. "Pinemat Manzanita; *Arctostaphylos nevadensis* Gray" in Plant Guide. http://plants.usda.gov/plantguide/pdf/pg_arne.pdf last accessed 5/20/07.

[ii] USDA NRCS. "Pinemat Manzanita…"

[iii] Kruckeberg, Arthur R. Gardening with Native Plants of the Pacific West; An Illustrated Guide. University of Washington Press, Seattle: 1997.

[iv] Van Dersal, William R. Native Woody Plants of the United States; Their Erosion-Control and Wildlife Values. US GPO, Washington DC, 1939.

[v] Berg, Arthur R. "*Arctostaphylos* Adans. Manzanita." In Seeds of Woody Plants in the United States. Edited by Schopmeyer, C.S. USDA Forest Service, Washington DC. 1974.

[vi] Trindle, Joan D.C. and Theresa R. Flessner. "Propagation protocol for vegetative production of container *Arctostaphylos nevadensis* Gray plants (1-gallon containers)" in Native Plant Network http://ww.nativeplantnetwork.org/network/view.asp?protocol_id=2350 last accessed 5/21/07

[vii] Carlson, Jack R. and W. Curtis Sharp. "Germination of High Elevation Manzanitas; Test Show that Greenleaf Manzanita Seed can be Germinated easily in the Greenhouse with 40-50 Percent Success." Tree Planters' Notes United States Department of Agriculture 26(3) Summer 1975

[viii] USDA Forest Service. "*Arctostaphylos nevadensis*" in Fire Effects Information System http://www.fs.fed.us/database/feis/plants/shrub/arcnev/all/htm last accessed 5/20/07.

[ix] Association of Official Seed Analysts. Handbook on Seeds of Browse-Shrubs and Forbs.

[x] Berg, Arthur R. "*Arctostaphylos* Adans. Manzanita."

[xi] Rose, Robin et al. Propagation of Pacific Northwest Native Plants. OSU Press, Corvallis: 1998.

[xii] Berg, Arthur R. "*Arctostaphylos* Adans. Manzanita."

[xiii] Trindle, Joan D.C. "Evaluating Acid Scarification Effects on Dormant *Acrtostaphylos nevadensis* Seeds. Combined Proceedings International Plant Propagators' Society. V45, 1995.

[xiv] Carlson, Jack R. and W. Curtis Sharp. "Germination of High Elevation Manzanitas…"

[xv] Bean, W.J. "*Arctostaphylos"* in Trees and Shrubs Hardy in the British Isles. St. Martin's Press, London: 1981.

[xvi] Sheat, Wilfrid G. Propagation of Trees, Shrubs and Conifers. MacMillan and Co., London: 1948.

[xvii] Macdonald, Bruce. Pracitcal Woody Plant Propagation for Nursery Growers: V.1. Timber Press, Portland: 1987

[xviii] Oosting, H.J. and W.D. Billings. "The red fir forest of the Sierra Nevada: Abietum magnificae." Ecological Monographs. 13(3) 260-273: 1943.

[xix] Rose, Robin et al. Propagation of Pacific Northwest Native Plants.

[xx] Berg, Arthur R. "*Arctostaphylos* Adans. Manzanita."

[xxi] Trindle, Joan D.C. and Theresa R. Flessner. "Propagation protocol…"

[xxii] Macdonald, Bruce. Pracitcal Woody Plant Propagation for Nursery Growers: Vol.1.

[xxiii] Trindle, Joan D.C. and Theresa R. Flessner. "Propagation protocol…"

[xxiv] Trindle, Joan D.C. and Theresa R. Flessner. "Propagation protocol…"

[xxv] USDA NRCS. "Pinemat Manzanita…"

[xxvi] VanderSchaff, Curtis L. et al. "The effect of multi-nutrient fertilization on understory vegetation nutrient concentrations in inland Northwest conifer stands." In Forest Ecology and Management. V 190, 2004 pp201-218.

[xxvii] Trindle, Joan D.C. and Theresa R. Flessner. "Propagation protocol …"